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Final Report for Grant NAG-2-613

Effects of Microgravity on Testicular Function in Rats

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Research conducted under subject project was reported to NASA in a "Final Technical Report" entitled "Cosmos-2044 Testis Studies (Experiment K-7-16) Effects of Microgravity or Simulated Launch on Testicular Function in Rats," submitted to Dr. R.E. Grindeland on September 13, 1990. This document has been, or will be, incorporated into an overall NASA final report to be published under the auspices of NASA.

In addition, a manuscript reporting the results of this study was submitted for publication to the editor of the *Journal of Applied Physiology* in January 1991. After an extraordinarily lengthy review process, comments of the reviewers were received on July 5, 1991, a revised version was resubmitted to *Journal of Applied Physiology* on July 8, and the manuscript was accepted for publication in the *Journal of Applied Physiology* on February 14, 1992. A copy of that manuscript was transmitted to Dr. R.E. Grindeland in July 1991.

Testes from flight rats on Cosmos-2044 and simulated-launch, vivarium, or caudal-elevation control rats (5/group) were analyzed by subjective and quantitative methods. Based on observations of fixed tissue, it was evident that some rats had testicular abnormalities unassociated with treatment, and probably existing when they were assigned randomly to the four treatment groups. Considering rats without pre-existing abnormalities, diameter of seminiferous tubules and numbers of germ cells per tubule cross section were lower ($P<0.05$) in flight than simulated-launch or vivarium rats. However, ratios of germ cells to each other, or to Sertoli cells, and number of homogenization resistant spermatids did not differ from values for simulated-launch or vivarium controls. Expression of testis-specific gene products was not greatly altered by flight. Furthermore, there was no evidence for production of stress-inducible transcripts of the *hsp*70 or *hsp*90 genes. Concentration of receptors for rLH in testicular tissue, and surface density of smooth endoplasmic reticulum in Leydig cells were similar in flight and simulated-launch rats. However, concentrations of testosterone in testicular tissue or peripheral blood plasma were reduced ($P<0.05$) in flight rats to <20% of values for simulated-launch or vivarium controls. Thus, spermatogenesis was essentially normal in flight rats, but production of testosterone was severely depressed. Exposure to microgravity for >2 wk might result in additional changes. Sequelae of reduced androgen production on turnover of muscle and bone should be considered.

Since the final technical report on this project was submitted to NASA on September 13, 1990, and the data now have been accepted for publication, all reporting requirements of subject grant are considered as having been fulfilled.